健康畜禽 Healthy Livestock

Biosecurity challenges to reduce the needs of antimicrobials in pig and broiler farming systems

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Horizon2020

Biosecurity

- aims at preventing exposure of animals to pathogens

- is a key component of preventing diseases in farm animals

Several tools have been developed to assess biosecurity

ifip Institut du porc

Grille analyse des risques

Organisation générale de l'élevage	*Bon*	*Moyen*	*A risque*	*NA*
Bâtiment monobloc ou bâtiments reliés par des couloirs fermés (hors quarantaine)	Oui		Non	
Sectorisation de l'élevage en 3 zones : publique, professionnelle et d'élevage	Oui	Partielle	Non	
Clôture continue autour du site d'exploitation empêchant tout passage de sangliers	Oui	Non bâtiment monobloc étanche avec sas d'entrée	Non	
Délimitation continue de la zone d'élevage (murs, grillage, haie ,..)	Oui ou bâtiment monobloc		Non	
Délimitation continue de la zone professionnelle (grillage, haie, chainette, talus...)	Oui		Non	

PORC Protect DE L'ifip

AUDIT BIOSECURITE EN ELEVAGE

BIOSECURITE

BIOSECURITE EXTERNE ET INTERNE

GHENT UNIVERSITY

biocheck .ugent

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BIOCHECK.UGent, prevention is better than cure!

External biosecurity

A	Purchase of animals and semen	90 %
B	Transport of animals, removal of manure and dead animals	65 %
C	Feed, water and equipment supply	43 %
D	Personnel and visitors	76 %
E	Vermin and bird control	100 %
F	Environment and region	80 %

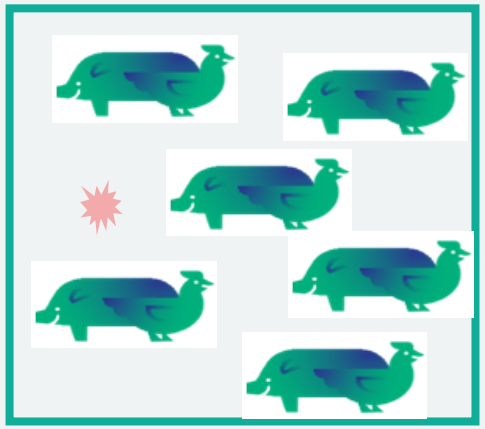
- External and internal biosecurity => resource-based evaluation

In HealthyLivestock we aim at identifying complementary new indicators which make possible monitoring based on the results of biosecurity measures

- In animal welfare: resource-based indicators (the environment) and animal-based indicators (how animals cope with their environment)
- In biosecurity: resource-based (classical=measures in place) and **biomarkers**
- **Biomarkers** reflect the level of exposure to pathogens that is encountered by the animals

Causal pathways and concept of biomarkers for biosecurity

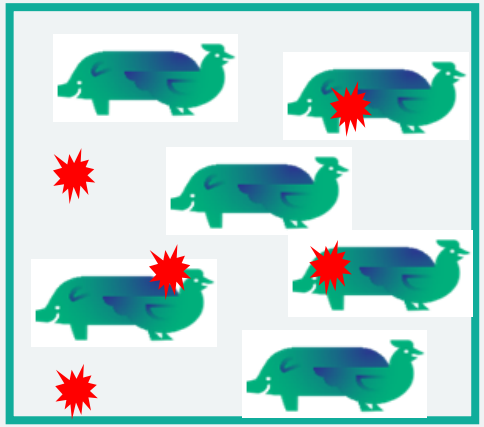
Time 0



Good biosecurity

- No or low exposure to pathogens

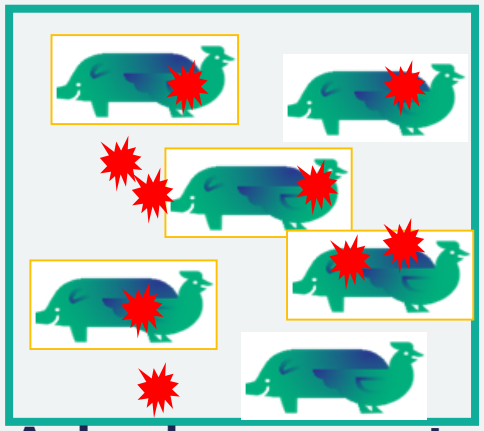
Time 1



Biosecurity failure

- Increased exposure to pathogens

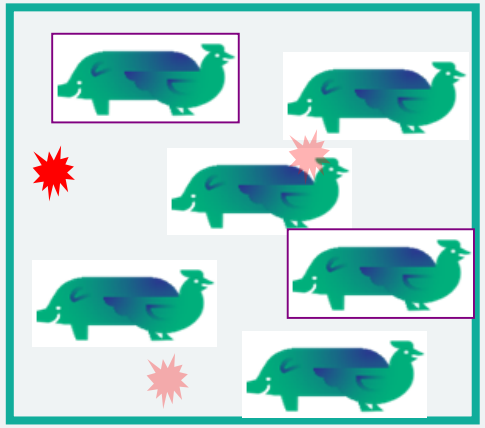
Time 2



Animal response to pathogen exposure

- Immune response
- Inflammatory response

Time 3



Animals don't cope with exposure and get diseased

- Clinical signs
- Drug use

Indicators of failure to prevent exposure to pathogens

Category	Examples
• Presence of a given known pathogen	• Isolation • PCR
• Specific response of the host exposure to a given known pathogen	• Antibodies • Interferon
• Non-specific immune or inflammatory response of the host exposure to pathogens	• Acute phase proteins • Oxydative stress index • Metabolites of the inflammatory response
• Indirect indicators evidencing transmission of infectious agents	• Campylobacter

Desirable characteristics of a biomarker

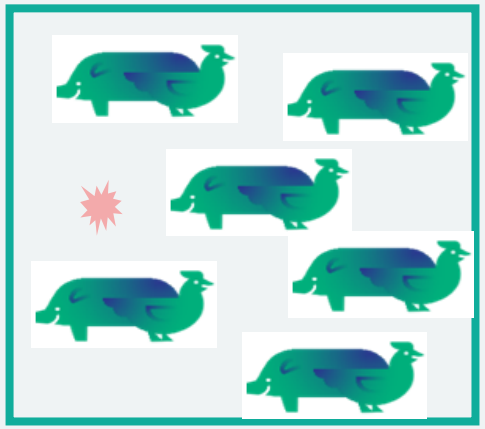
- **Biological accuracy**
  - Relies on available knowledge of the biological processes
  - Limitations: biological indicators were developed for diagnosis or to decipher complex mechanisms in the pathogenesis of a disease
- **Sensitivity and specificity**
- **Practical implementation**
  - In the farm, for transport
  - In the lab
- **Reproductibility in the lab**
  - Comparison of results obtained in different contexts
- **Cost**

Definition of a biomarker for biosecurity monitoring

- **What is measured**
- **Who: who are the animals at risk to be targeted**
- **How:**
  - How and what samples to be taken
  - How to store and transport
  - How to analyse
- **How many: based on expected prevalence and population size**
- **When: age, repetition, frequency**
- **So what: how to interpret**

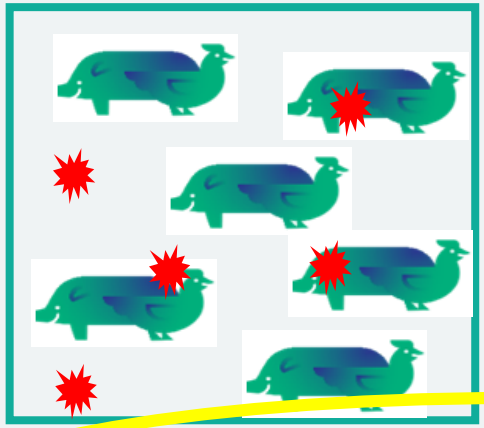
Select a set of hypothetical biomarkers

Time 0



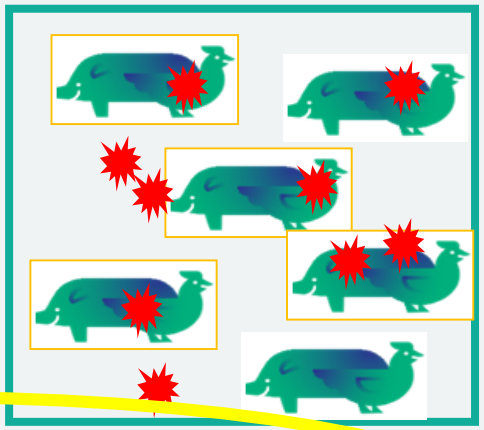
Reference level

Time 1



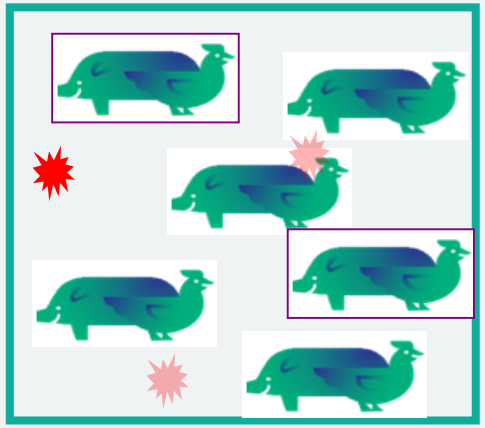
Pathogen presence

Time 2



Animal responses

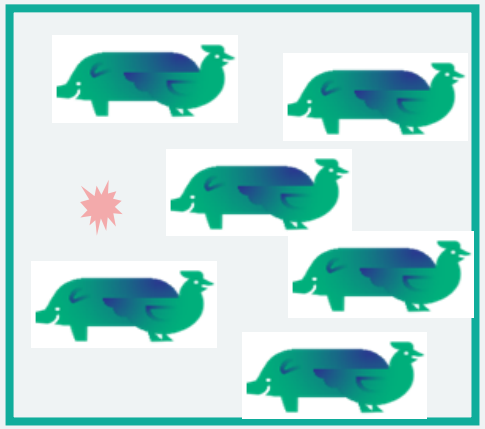
Time 3



Too late for biomarkers !

Longitudinal study in 2 x 40 herds

Time 0



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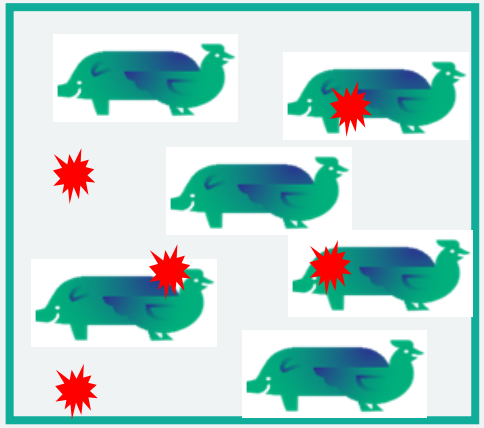

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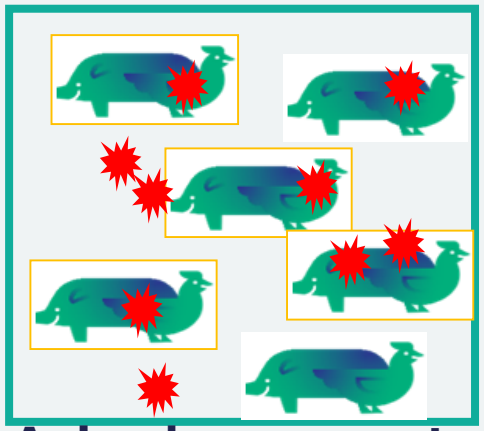

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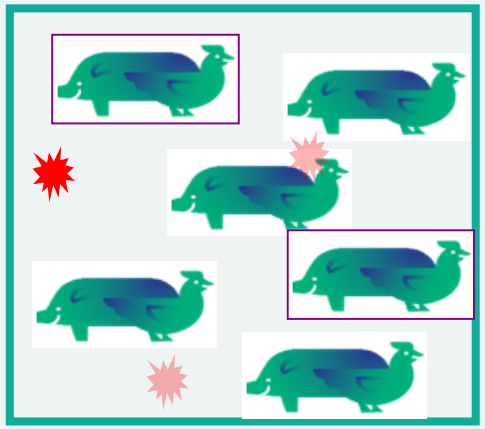

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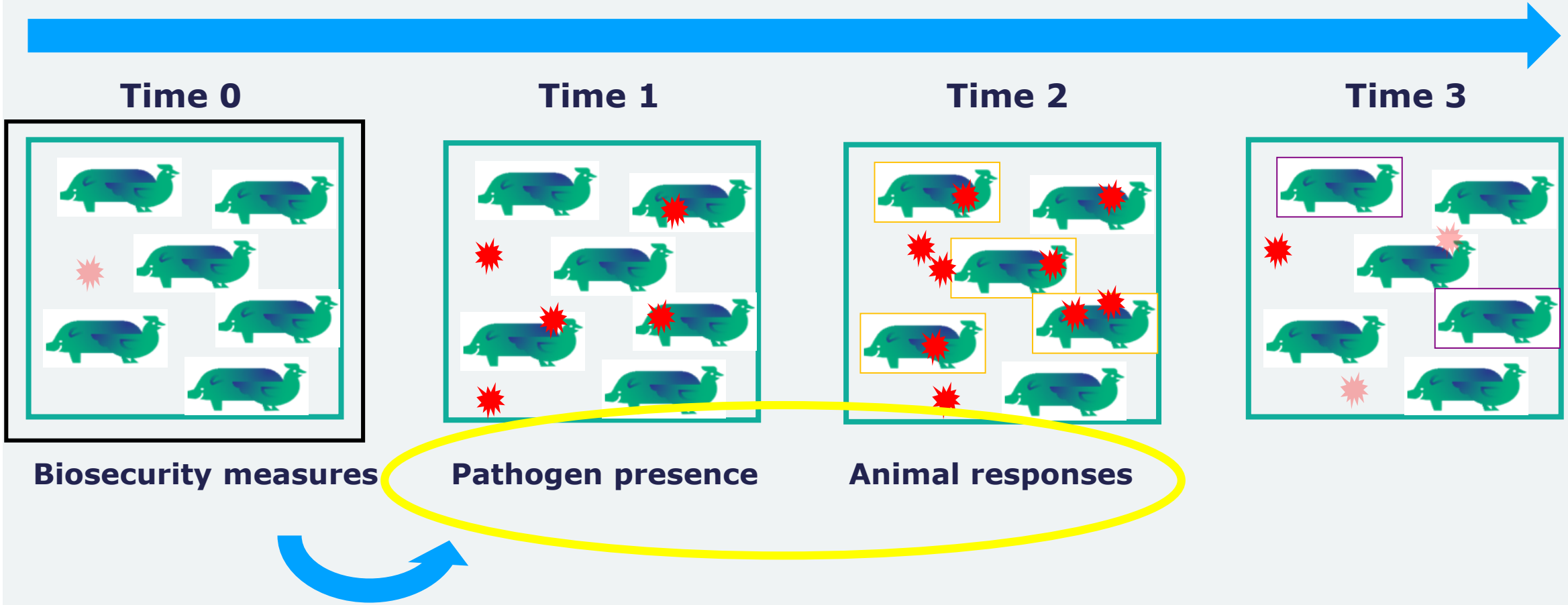
Analyse associations



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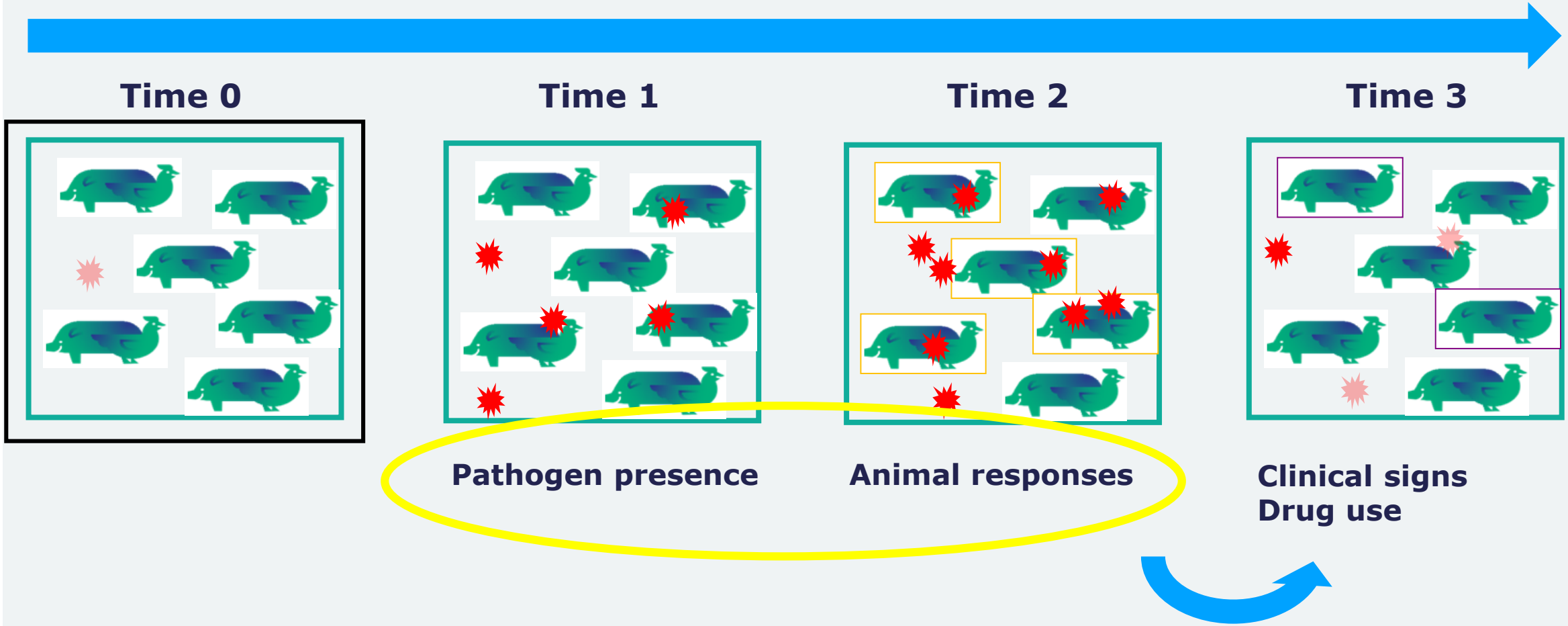

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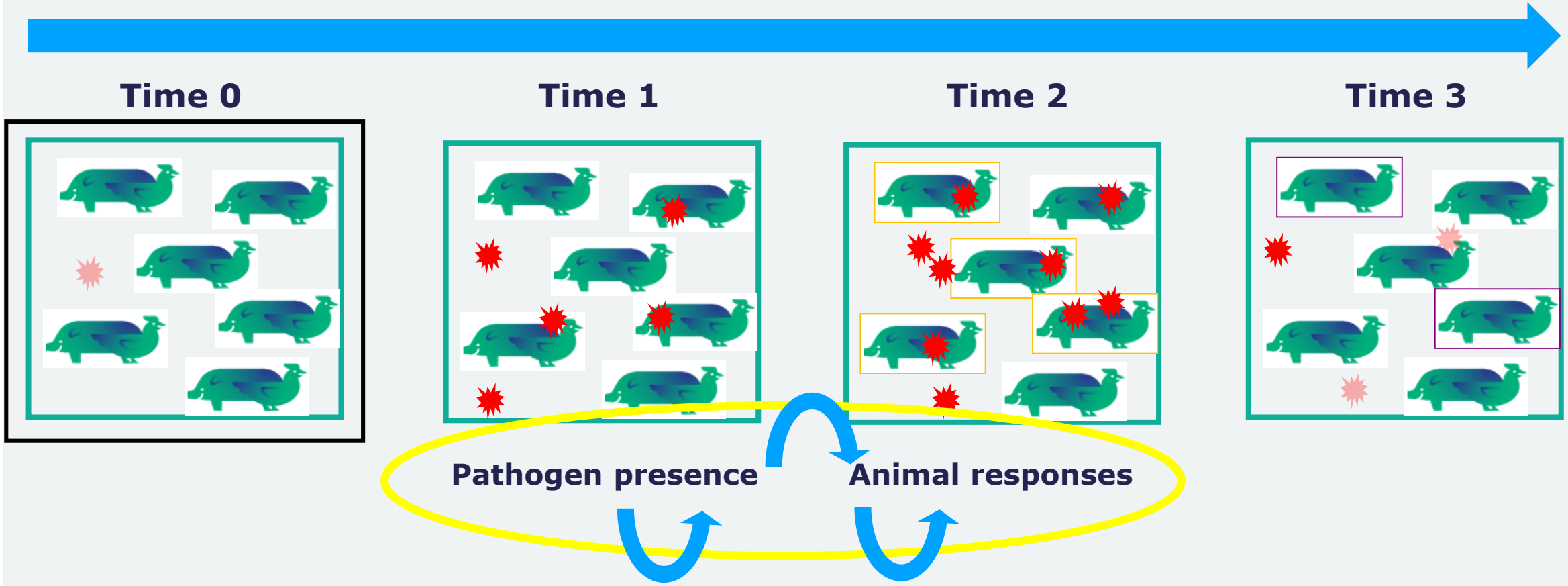
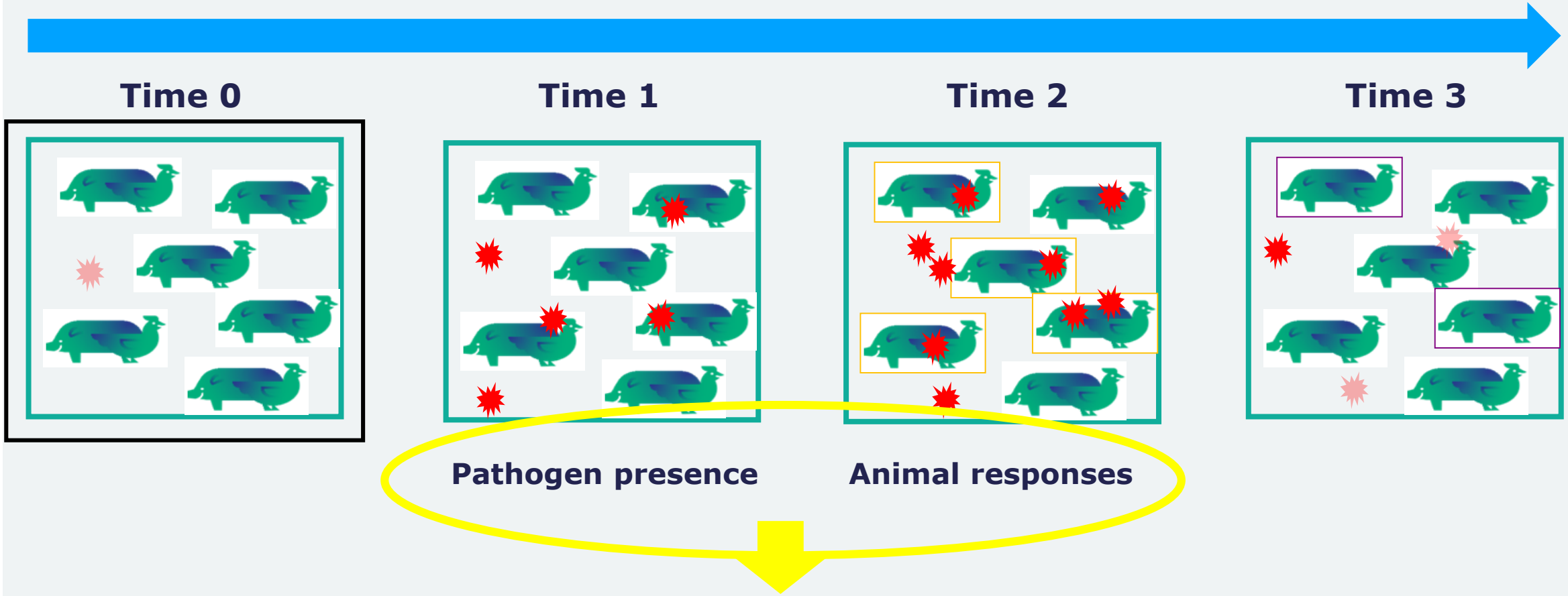


Select a restricted set of biomarkers



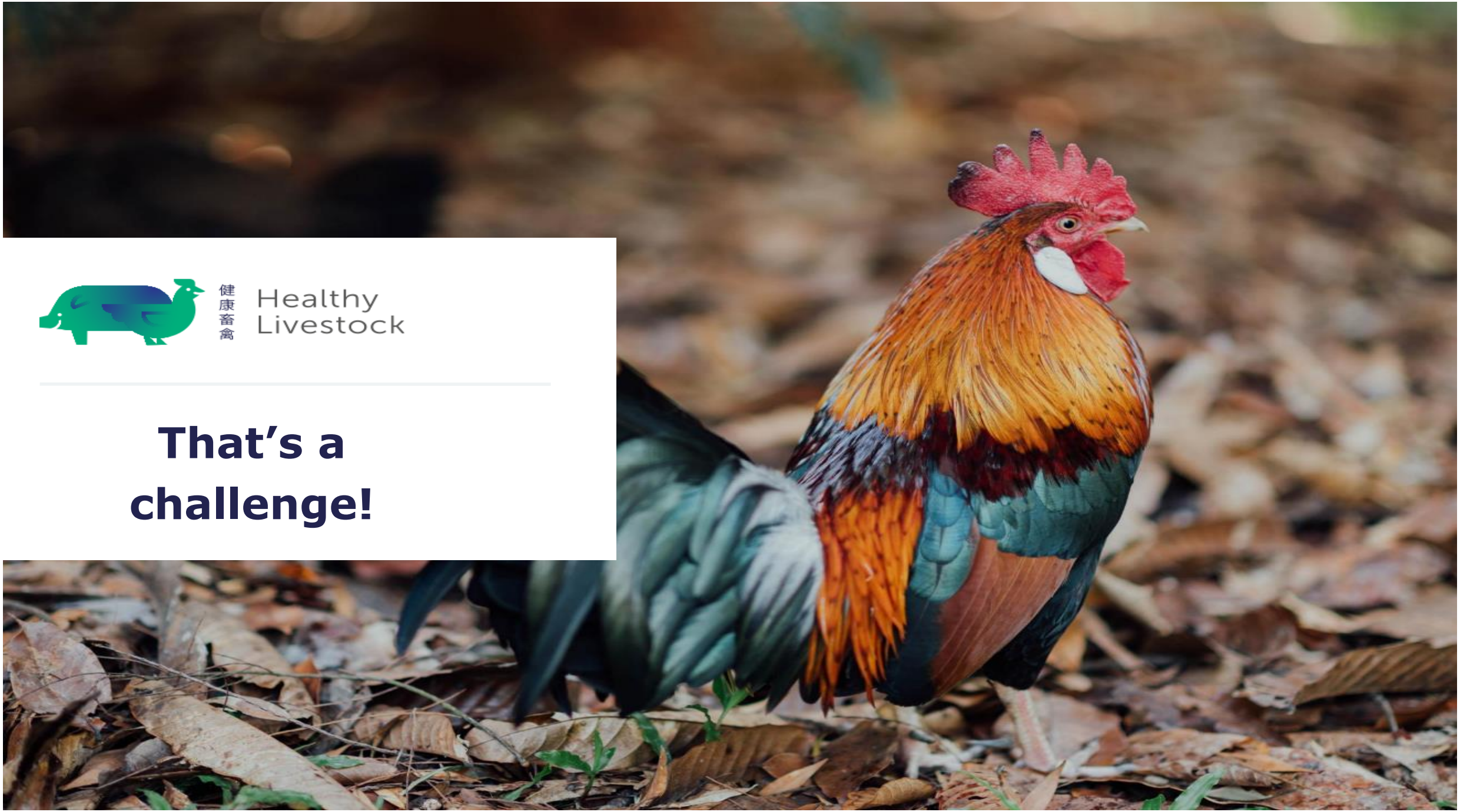
Expected outputs for decision-making

A limited set of indicators

- at reasonable cost

- easy to implement

- with a high informative value



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That’s a challenge!

Thank you!